REMARKS

Claims 1-46 are pending for consideration. As a preliminary matter, on the Office Action Summary form, the Office checked the box indicating that claims 1-46 are objected to. The Office gave no basis for such objections; therefore, the Applicant assumes the box was checked in error.

In view of the following remarks, Applicant respectfully requests reconsideration and withdrawal of the rejections.

§ 102 Rejections

Claims 1-46 stand rejected under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent No. 6,115,052 to Freeman et al. (hereinafter "Freeman"). Applicant respectfully traverses the rejection under 35 U.S.C. 102(a).

Before discussing how Applicant's claimed subject matter patentably distinguishes over Freeman, a brief discussion of Freeman's disclosure is provided to assist Applicant in identifying Applicant's patentable distinctions.

The Freeman Reference

Freeman discloses a system for reconstructing the 3-dimensional motions of a human figure from a monocularly viewed image sequence (referred to as "2-d video data").

Freeman's system is shown in its Fig. 1, where a system 10 provides a 3-dimensional estimate of body motion of an individual that can be used to provide cartoon characters whose motions resemble the motions of an actor.

In accordance with Freeman's system, an actor 12 has his movements filmed by a video camera 14, which are then digitized at 16 and coupled to an optimizer 20, the purpose of which is to find the optimal 3-d body coordinates, given a 3-d motion training data set 22.

The training data is divided up into snippets or segments which define so called basis vectors for human motion. Multiplying these values by coefficients and adding the results yields the new motions. The basis vector is described by Freeman as a vector having the following components: a frame number, the number of each marker in that frame, and the x, y, and z positions of each marker. Note that the markers are obtained from the training data set. The markers in the training set indicate the positions of various positions on the body which describe the body part position. ***These are similar to placing physical markers on the clothing of the individual and measuring the 3-d position of those physical markers by triangulating from multiple cameras.*** These example motion sequences in the form of a training set provide the a priori data used in subject system.

Freeman notes that a snippet has a pre-determined number of frames. Moreover, Freeman notes that there is an offset which describes how many frames are skipped between the start of one snippet and the next.

As described by Freeman, it is the purpose of optimizer 22 to find the set of coefficients of the 3-d motion training data set which (1) best explains the input

video data, and (2) accounts for user corrections. ***The 3-d estimates are derived from the 2-d video data through finding the most probable linear combination of the 3-d training data that explains the 2-d image information and the 2-d user corrections.***

In order to complete the 3-d description of the body motion, it is necessary to guess the 3rd dimension. Freeman accomplishes this by starting with the 3rd dimension information from the training data 22. Specifically, a prior preference for particular linear combinations of the training data is formed. This is obtained from the training data. ***Then optimizer 20 trades off the strength of the prior preference for a given linear combination against how well that linear combination explains the input video data and accounts for the user corrections.***

Optimizer 20 iteratively searches for an optimum linear combination of training motion snippets and outputs the optimum set of coefficients for the motion under study. As illustrated at 24, this output is referred to as the estimated 3-d coordinates of the aforementioned body markers.

The only real similarity between Freeman's disclosure and the various claimed embodiments is that both are attempting to infer new positions related to a human body. The ways in which this is accomplished are quite different from one another.

Claims 1-12

Claim 1 recites a blending method comprising:

- providing a set of examples that pertain to a shape or motion that is to be animated, the examples being provided relative to a multi-dimensional abstract space;
- selecting a point within the multi-dimensional abstract space that does not coincide with a point that is associated with any of the examples, the selected point corresponding to a shape or motion within the abstract space;
- computing a ***single weight*** value for each of the examples; and
- combining the single weight values for each of the examples in a manner that defines an interpolated shape or motion that is a blended combination of each of the examples of the set of examples.

The Office argues that Freeman discloses, in column 2, lines 7-24, computing a single weight value for each example. That excerpt is set forth below:

> In one embodiment, the optimizer performs its function in accordance with the following formula: [Equation Omitted] where E(.alpha.) is the energy function to be minimized by the optimal coefficients .alpha. to be found, R is the vector of sensor responses over time from the image data. The function f converts .alpha. body motion coefficients to predicted sensor responses. I.sub.i is the ith point position specified bye[sic] the user, and P.sub.i projects the .alpha. coefficients onto the corresponding ith stick figure part 2-d position. .lambda..sub.1 and .lambda..sub.2 are constants which reflect the weights of the image data, the priors over human motions, and the interactively specified 2-d point matches.

Freeman does not appear to disclose, and this passage in Freeman does not disclose computing a ***single weight*** value for each of the examples, as such term is contemplated in Applicant's specification. Accordingly, for at least this reason, this claim is allowable.

Because Freeman does not disclose computing a single weight value, it cannot disclose ***combining single weight values*** for each of the examples. Accordingly, for this additional reason, this claim is allowable. As Freeman does not disclose or suggest computing a single weight for each example, and then combining the single weight values, Freeman cannot disclose doing so in a manner that defines an ***interpolated*** shape or motion that is a ***blended combination*** of each of the examples of the set of examples.

Accordingly, for at least these reasons, claim 1 is allowable.

Claims 2-12 depend from claim 1 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 1, are neither disclosed nor suggested by Freeman.

Claims 13-21

Claim 13 recites a blending method comprising:

- linearly approximating a degree of freedom that is associated with a new form or motion that is to be rendered based upon a plurality of examples that define respective forms or motions within an abstract space;
- defining a ***radial basis function*** for each of the examples;
- combining the linear approximation and the radial basis functions to provide a ***cardinal basis function***; and
- using the cardinal basis function to render the new form or motion.

Freeman simply does not disclose any such methodology. In making out the rejection of this claim, the Office argues that Freeman discloses, in column 2,

lines 29-39, defining a radial basis function for each the examples. That excerpt is set forth below:

> In the subject invention the 3-d reconstruction in a simplified image rendering domain utilizes a Bayesian analysis to provide analytic solutions to fundamental questions about estimating figural motion from image data. Applying the Bayesian method to real images permits reconstruction of human figure motions from archival video, with the subject system accommodating interactive correction of automated 2-d tracking errors that allows reconstruction even from difficult film sequences. In one embodiment, a stick figure is overlain on an image of a moving human to allow the user to ascertain and correct 2-d motion estimate errors.

Nowhere in this excerpt does Freeman disclose defining a ***radial basis function*** for each of the examples. Instead, Freeman discloses inferring the 3rd dimension through Bayesian analysis of the 2-d training data and 2-d user corrections. There is no indication that Freeman uses radial basis functions as part of the Bayesian analysis.

The Office further argues that Freeman discloses, in column 2, lines 7-24, combining the linear approximation and the radial basis functions to provide a ***cardinal basis function***. This excerpt is set forth above. Nowhere does Freeman disclose combining the linear approximation and the radial basis functions to provide a ***cardinal basis function***. Accordingly, for at least these reasons, this claim is allowable.

The Office then argues that Freeman discloses, in column 2, lines 29-39, using a cardinal basis function to render the new form or motion. That excerpt, previously set forth above, provides no indication whatsoever that Freeman uses a ***cardinal basis function*** to render the new form or motion.

Accordingly, for at least these reasons, claim 13 is allowable.

Claims 14-21 depend from claim 13 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 13, are neither shown nor suggested by Freeman, either singly or in combination with any other references of record.

<u>Claims 22-27</u>

Claim 22 recites, in pertinent part, one or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, cause the computer to:

- linearly approximate a degree of freedom that is associated with a new form or motion that is to be rendered based upon a plurality of examples that define respective forms or motions within an abstract space, by deriving basis hyperplanes that fit a least squares hyperplane to a case where one example has a value of 1 and the remaining examples have values of 0;
- account for residuals between the example values and the hyperplane by:
    - associating a radial basis function with each example;
    - ascertaining a radial basis weight value for each radial basis function; and
    - scaling each radial basis function by its ascertained radial basis weight value; and
- sum the linear approximation and scaled radial basis functions to provide a cardinal basis function.

The Office is referred to Figs. 7 and 8 and the related discussion appearing in the specification for examples or embodiments that practice this methodology.

In making out this rejection, the Office argues that Freeman discloses the subject matter of this claim and cites, in support of its rejection, to Figs. 1 and 8,

and related discussion appearing in column 9, lines 1-16. Applicant respectfully disagrees with the Office. Specifically, nowhere does Freeman appear to disclose or suggest the subject matter that is recited in this claim. For example, nowhere does Freeman appear to disclose or suggest summing a linear approximation and scaled radial basis functions to provide a ***cardinal basis function***.

Accordingly, for at least this reason, claim 22 is allowable.

Claims 23-27 depend from claim 22 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 22, are not disclosed by Freeman.

Claims 28-33

Claim 28 recites a computerized blending system comprising:

- at least one computer-readable media;
- at least one processor;
- instructions resident on the computer-readable media which, when executed by the processor, cause the blending system to:
    - linearly approximate a degree of freedom that is associated with a new form or motion that is to be rendered based upon a plurality of examples that define respective forms or motions within an abstract space, by deriving basis hyperplanes that fit a least squares hyperplane to a case where one example has a value of 1 and the remaining examples have values of 0;
    - account for residuals between the example values and the hyperplane by:
        - associating a radial basis function with each example;
        - ascertaining a radial basis weight value for each radial basis function; and
        - scaling each radial basis function by its ascertained radial basis weight value; and
    - sum the linear approximation and scaled radial basis functions to provide a cardinal basis function.

The Office argues that Freeman discloses the subject matter of this claim citing some of the same sections in Freeman that were used to make out the rejections of claim 22 above. Applicant respectfully disagrees.

As discussed earlier, Freeman does not appear to disclose, among other things, summing the linear approximation and scaled radial basis functions to provide a ***cardinal basis function***.

Accordingly, for at least this reason, claim 28 is allowable.

Claims 29-33 depend from claim 28 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 28, are not disclosed by Freeman.

Claims 34-38

Claim 34 recites a blending method comprising:

- defining a set of examples that pertain to a form or motion that is to be animated, the examples being provided relative to a multi-dimensional abstract space;
- examining a plurality of forms or motions that are animated within the abstract space from the defined set of examples;
- identifying at least one form or motion that is undesirable;
- selecting a form or motion from a location within the abstract space that is proximate a location that corresponds to the undesirable form or motion; and
- replacing the undesirable form or motion with the selected form or motion to provide a pseudo-example that constitutes a linear sum of the examples of the set of examples.

The Office is referred to Fig. 16 for an example embodiment of a pseudo-example that constitutes a linear sum of the examples of the set of examples. Fig. 16 is a visualization of a 2D space of arms with four real examples and one pseudo-example. Elbow bend is parameterized along the horizontal axis and gender along the vertical.

In making out the rejection of this claim, the Office argues that Freeman discloses replacing the undesirable form or motion with the selected form or motion to provide a pseudo-example that constitutes a linear sum of the examples of the set of examples in the source code in column 29. The relevant portion of column 29 is reproduced below:

```
%   E = canny(I, SD, TH1) uses TH1 for the higher hysteresis
%   threshold.
%   Default is 0.5 times the strongest edge. Setting TH1 to zero
%   will
%   avoid the (sometimes time consuming) hysteresis.
%
%   E = canny(I, SD, TH1, TH0) uses TH1 for the lower hysteresis
%   threshold.
%   Default is 0.1 times the strongest edge.
%
%   See also EDGE (in the Image Processing toolbox).
if nargin<2 sd= 1; end; if isempty(sd), sd= 1; end;
if nargin<3 th1= .5; end; if isempty(th1), th1= .5; end;
if nargin<4 th0= .1; end; if isempty(th0), th0= .1; end;
x= -5*sd:sd*5;
g= exp(-0.5/sd 2*x 2);
            % Create a normalized Gaussian
%
g= g(g>max(g)*.005); g= g/sum(g(:));
dg= diff(g);    % Gaussian first derivative
dx= abs(conv2(I, dg, `same`));
            % X/Y edges
dy= abs(conv2(I, dg', `same`));
dx = smooth(dx, 1);
dy = smooth(dy, 1);
[ny, nx]= size(I);
            % Find maxima
dy0= [dy(2:ny,:); dy(ny,:)]; dy2= [dy(1,:); dy(1:ny-1,:)];
dx0= [dx(:, 2:nx) dx(:,nx)]; dx2= [dx(:,1) dx(:,1:nx-i)];
peaks= find((dy>dy0 & dy>dy2) .vertline. (dx>dx0 & dx>dx2));
peaks.sub.-- y = find((dy>dy0 & dy>dy2));
peaks.sub.-- x = find((dx>dx0 & dx>dx2));
```

```
e= zeros(size(I));
e(peaks.sub.-- x)= dx(peaks.sub.-- x);
e(peaks.sub.-- y) = max(e(peaks.sub.-- y), dy(peaks.sub.-- y));
e(:,2) = zeros(ny,1); e(2,:)= zeros(1,nx); %, Remove artificial
% edges
e(: ,nx-2)= zeros(ny,1); e(ny-2, :)= zeros(1,nx);
e(:,1) = zeros(ny,1); e(1,:)= zeros(1,nx);
e(:,nx) = zeros(ny,1); e(ny,:)= zeros(1,nx);
e(:,nx-)= zeros(ny,1); e(ny-1,:)= zeros(1,nx);
e= e/max(e(:));
if thi == 0, E= e; return; end
        % Perform hysteresis
E(ny,nx)= 0;
p= find(e >= thi);
while length(p)
E(p)= e(p);
e(p)= zeros(size(p));
n= [p+i p-i p+ny p-ny p-ny-1 p-ny+1 p+ny-1 p+ny+1]; % direct
% neighbors
On= zeros(ny,nx); On(n)= n;
p= find(e > tho & On);
end
```

Nowhere does Freeman appear to disclose or suggest a pseudo-example, or use of a pseudo-example as recited in claim 34. Accordingly, for at least this reason, claim 34 is allowable.

Claims 35-38 depend from claim 34 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 34, are not disclosed by Freeman.

Claims 39-46

Claim 39 recites a blending method comprising:

- defining at least two examples of a form, a first of the example forms being defined in a first position and a second of the example forms being defined in a second position that is different from the first position; and

- computing a form in the first position such that when the computed form is subjected to a transform blending operation that places the computed form in the second position, it will match the second example form.

The Office argues that this step is inherent because "in order to define two different positions, one must have defined first and second positions for computing the parameters which is involved."

Applicant respectfully asserts that the Office's ground for the rejection of this claim completely disregards the second act in the recited blending method. The Office is referred to Fig. 14 for one example of how Applicant's recited blending method works. Fig. 14 shows a straight arm example, one of six examples of this shape. The results above the straight arm are the result of naively blending transforms on this one example. On the bottom right is a blend of the six examples untransformed to the rest position. Finally, this strange blended form is pushed through the blended transformation to the give the result shown in the upper right.

Nowhere does Freeman disclose or suggest the methodology recited in this claim. Further, Applicant respectfully disagrees that any aspect of Applicant's recited method is inherent.

Accordingly, for at least this reason, claim 39 is allowable.

Claims 40-46 depend from claim 39 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 39, are not disclosed by Freeman.

Conclusion

Applicant respectfully submits that all of the claims are in condition for allowance and, accordingly, requests that a Notice of Allowability be issued forthwith. If the next anticipated action is to be anything other than issuance of a Notice of Allowability, Applicant respectfully requests a telephone call for the purpose of scheduling an interview.

Respectfully Submitted,

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